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NEW JERSEY DEPT OF ENVIRONMENTAL PROTECTION TRENTON F/G 13/13
NATIONAL DAM SAFETY PROGRAM. N.J. NO NAME DAM NUMBER 58 (NJ0065--ETC(U)
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(6) National Dam Safety Program. N.J. No Name Dam Number 58 (NJ00653), Wallkill River Basin, Tributary to Papakating Creek, Sussex County, New Jersey. Phase I Inspection Report.

REPORT DOCUMENTATION PAGE	
1. REPORT NUMBER DAEN/NAP 53842/NJ00653-81/07	2. GOVT ACCESSION NO. AD-101454
3. RECIPIENT'S CATALOG NUMBER	
4. TITLE (and Subtitle) Phase I Inspection Report National Dam Safety Program N.J. No Name Dam No. 58, NJ00653 Sussex County, New Jersey	5. TYPE OF REPORT & PERIOD COVERED (9) FINAL rept.
6. AUTHOR(s) (10) Perera, Abraham, P.E.	7. PERFORMING ORG. REPORT NUMBER DAEN/NAP-53842/NJ00653-81/07
8. CONTRACT OR GRANT NUMBER(s) DACW61-79-C-0011	
9. PERFORMING ORGANIZATION NAME AND ADDRESS Louis Berger Assoc. 100 Halstead St. East Orange, N.J. 07932	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS 1511
11. CONTROLLING OFFICE NAME AND ADDRESS NJ Department of Environmental Protection Division of Water Resources P.O. Box CNO29 Trenton, NJ 08625	12. REPORT DATE (11) July 1981
13. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office) U.S. Army Engineer District, Philadelphia Custom House, 2d & Chestnut Streets Philadelphia, PA 19106	14. NUMBER OF PAGES 50
15. SECURITY CLASS. (of this report) Unclassified	16a. DECLASSIFICATION/DOWNGRADING SCHEDULE
16. DISTRIBUTION STATEMENT (of this Report) Approved for public release; distribution unlimited.	
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)	
18. SUPPLEMENTARY NOTES Copies are obtainable from National Technical Information Service, Springfield, Virginia 22151.	
19. KEY WORDS (Continue on reverse side if necessary and identify by block number) Dams National Dam Safety Program Embankments N.J. No Name Dam No. 58, New Jersey Visual Inspection Spillways Structural Analysis	
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) This report cites results of a technical investigation as to the dam's adequacy. The inspection and evaluation of the dam is as prescribed by the National Dam Inspection Act, Public Law 92-367. The technical investigation includes visual inspection, review of available design and construction records, and preliminary structural and hydraulic and hydrologic calculations, as applicable. An assessment of the dam's general condition is included in the report.	

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DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
CUSTOM HOUSE-2 D & CHESTNUT STREETS
PHILADELPHIA, PENNSYLVANIA 19106

IN REPLY REFER TO
NAPEN-N

Honorable Brendan T. Byrne
Governor of New Jersey
Trenton, New Jersey 08621

30 JUN 1961

Dear Governor Byrne:

Inclosed is the Phase I Inspection Report for N.J. No Name No. 58 Dam, Sussex County, New Jersey which has been prepared under authorization of the Dam Inspection Act, Public Law 92-367. A brief assessment of the dam's condition is given in the front of the report.

Based on visual inspection, available records, calculations and past operational performance, New Jersey No Name No. 58 Dam, initially listed as a high hazard potential structure but reduced to a low hazard potential structure as a result of this inspection, is judged to be in fair overall condition. However, the spillway is considered inadequate, as 25 percent of the 100 year design flood would cause the dam to be overtopped. The low hazard potential classification means that in the event of failure of the dam, no loss of life and only minimal economic loss is expected. For the same reasons no further studies or increase of spillway capacity are recommended. However, to assure the continued functioning of the dam and its impoundment, the following remedial actions could be undertaken by the owner:

a. The gate valve for the 24-inch outlet pipe should be located and the control tested to ensure its proper functioning.

b. Silt should be removed from the outlet pipe.

c. Trees and brush should be removed from the embankment, the crest should be regraded, the crest and back slope should be reseeded and the animal burrows should be filled.

d. The earth in the spillway channel should be removed, the deteriorated concrete repaired and the undercut portions of the sidewalls refilled.

e. Written operating procedures and a periodic maintenance plan should be developed to ensure the safety of the dam.

NAPEN-N

Honorable Brendan T. Byrne

A copy of the report is being furnished to Mr. Dirk C. Hofman, New Jersey Department of Environmental Protection, the designated State Office contact for this program. Within five days of the date of this letter, a copy will also be sent to Congressman Courter of the Thirteenth District. Under the provision of the Freedom of Information Act, the inspection report will be subject to release by this office, upon request, five days after the date of this letter.

Additional copies of this report may be obtained from the National Technical Information Services (NTIS), Springfield, Virginia 22161 at a reasonable cost. Please allow four to six weeks from the date of this letter for NTIS to have copies of the report available.

An important aspect of the Dam Inspection Program will be the implementation of the recommendations made as a result of the inspection. We accordingly request that we be advised of proposed actions taken by the State to implement our recommendations.

Sincerely,

1 Incl
As stated

for Kenneth R. Moser MajCE DDE
JAMES G. TON
Colonel, Corps of Engineers
Commander and District Engineer

Copies furnished:
Mr. Dirk C. Hofman, P.E., Deputy Director
Division of Water Resources
N.J. Dept. of Environmental Protection
P.O. Box CN029
Trenton, NJ 08625

Mr. John O'Dowd, Acting Chief
Bureau of Flood Plain Regulation
Division of Water Resources
N.J. Dept. of Environmental Protection
P.O. Box CN029
Trenton, NJ 08625

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NEW JERSEY NO NAME DAM NO. 58 (NJ00653)

CORPS OF ENGINEERS ASSESSMENT OF GENERAL CONDITIONS

This dam was inspected on 26 March 1981 by Louis Berger and Associates, Inc. under contract to the State of New Jersey. The State, under agreement with the U.S. Army Engineer District, Philadelphia, had this inspection performed in accordance with the National Dam Inspection Act, Public Law 92-367.

New Jersey No Name No. 58 Dam, initially listed as a high hazard potential structure but reduced to a low hazard potential structure as a result of this inspection, is judged to be in fair overall condition. The spillway is considered inadequate, as 25 percent of the 100 year design flood would cause the dam to be overtopped. The low hazard potential classification means that in the event of failure of the dam, no loss of life and only minimal economic loss is expected. For the same reasons no further studies or increase of spillway capacity are recommended. However, to assure the continued functioning of the dam and its impoundment, the following remedial actions could be undertaken by the owner:

- a. The gate valve for the 24-inch outlet pipe should be located and the control tested to ensure its proper functioning.
- b. Silt should be removed from the outlet pipe.
- c. Trees and brush should be removed from the embankment, the crest should be regraded, the crest and back slope should be reseeded and the animal burrows should be filled.
- d. The earth in the spillway channel should be removed, the deteriorated concrete repaired and the undercut portions of the sidewalls refilled.
- e. Written operating procedures and a periodic maintenance plan should be developed to ensure the safety of the dam.

APPROVED:

Kenneth R. Mason
for JAMES G. TON
Colonel, Corps of Engineers
Commander and District Engineer

DATE: 30 June 1981

PHASE I REPORT
NATIONAL DAM INSPECTION PROGRAM

Name of Dam N.J. No Name Dam No. 58 Fed ID# NJ 00653

State Located	<u>New Jersey</u>
County Located	<u>Sussex</u>
Coordinates	<u>Lat. 4111.8 - Long. 7439.0</u>
Stream	<u>Tributary to Papakating Creek</u>
Date of Inspection	<u>26 March 1981</u>

ASSESSMENT OF
GENERAL CONDITIONS

N.J. No Name Dam No. 58 is considered to be in fair overall condition, although the spillway capacity can accommodate only 24% of the 100-year design flood. In view of the fact that no loss of life and only minimal property damage would result from a dam failure, it is recommended that the dam's hazard classification be downgraded to low. For the same reasons no further studies or increase of spillway capacity are recommended. However, to assure the continued functioning of the dam and its impoundment, the following remedial actions could be undertaken by the owner: 1) removal of silt from the outlet pipe and inspection of the gate valve; 2) removal of trees and brush from the embankment, regrading and reseeding of the crest, and refilling the rodent burrows; and 3) cleaning the spillway channel, repairing deteriorated concrete, and refilling the undercut portions of the spillway sidewalls.



A. Perera P.E.
Project Manager



OVERVIEW OF NO NAME DAM No. 58

MARCH , 1981

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PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. The test flood provides a measure of relative spillway capacity and serves as an aide in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
NAME OF DAM N.J. No Name Dam No. 58 FED #NJ 00653

SECTION 1 - PROJECT INFORMATION

1.1 GENERAL

a. Authority

This report is authorized by the Dam Inspection Act, Public Law 92-367, and has been prepared in accordance with Contract FPM-36 between Louis Berger & Associates, Inc. and the State of New Jersey and its Department of Environmental Protection, Division of Water Resources. The state, in turn, is under agreement with the U.S. Army Corps of Engineers, Philadelphia to have this inspection performed.

b. Purpose of Inspection

The purpose of this inspection is to evaluate the structural and hydraulic condition of N.J. No Name Dam No. 58 and appurtenant structures and to determine if the dam constitutes a hazard to human life or property.

1.2 DESCRIPTION OF PROJECT

a. Description of Dam and Appurtenances

N.J. No Name Dam No. 58 is a 110-foot-long earthen structure with a crest width of 25 feet and a downstream slope that varies from 3H:1V to 1H:1V. A 10-foot-wide, 3-foot-thick stone drain extends along the entire downstream toe of the dam and the upstream face is protected by hand placed riprap as large as 24 inches in diameter. A 24-inch-diameter steel outlet pipe is located about 11 feet from the left abutment at invert elevation 555.6, and the principal spillway, which is located 300 feet to the north of the dam, consists of a 6.3-foot-long concrete weir with 1.6-foot-high sidewalls. The maximum height of the dam is about 18.2 feet, and the upstream slope, extent of the riprap, and location of the controls for the outlet pipe are unknown.

b. Location

The dam impounds a small lake 3,500 feet southwest of the falls on the West Branch tributary to the Papakating Creek in the community of Woodburne, Wantage Township, Sussex County, New Jersey. Access to the dam is possible via an unnamed dirt road which intersects Pidgeon Hill Road about 4,300 feet southwest of the junctions of Haggerty Road and County Road 565. The dam is located about one-half mile west-southwest of Highpoint Regional High School.

c. Size Classification

N.J. No Name Dam No. 58 has a maximum height of 18.2 feet and a maximum storage capacity of 167 acre-feet. Accordingly, this dam is in the small size category as defined by the criteria in the Recommended Guidelines for Safety Inspection of Dams (storage less than 1,000 acre-feet and height less than 40 feet).

d. Hazard Classification

The dam is located in a sparsely inhabited area of Sussex County characterized by low, rolling topography. The downstream valley is completely uninhabited for 2,600 feet, at which point the stream passes through a 5-foot-diameter reinforced concrete pipe culvert under Pidgeon Hill Road. About 6,000 feet downstream of the dam, the stream passes through an 8' x 10' box culvert under the Ross Corner-Sussex Road. Except for one home on the east side of Pidgeon Hill Road and another on the west side of Ross Corner-Sussex Road there are no residences between the dam and Papakating Creek. Although the roads could be flooded, it is felt that damage would be minimal and the homes are well above flood elevations. Accordingly, it is recommended that this dam be downgraded to a low hazard classification.

e. Ownership

This dam is owned by Westgate Associated, 345 Boulevard, Hasbruck Heights, New Jersey 07604.

f. Purpose of Dam

Although no state application for construction permit was located, it is believed that this dam was constructed for developmental and investment purposes.

g. Design and Construction History

Nothing is known concerning the design or construction, although it is reputed to have been constructed in the early 1960s.

h. Normal Operation Procedures

Nothing is known concerning operations, and the dam has apparently been unattended for several years.

1.3 PERTINENT DATA

a. Drainage Area

N.J. No Name Dam No. 58 has a drainage area of 0.78 square miles that consists primarily of rolling woodlands.

b. The spillway capacity at maximum pool elevation is 255 cfs

c. Elevations (ft. above NGVD)

Top of dam - 573.8
Principal spillway crest - 571.0
Streambed at centerline of dam - 555.4

d. Reservoir

Length of maximum pool (top of dam) - 1,500 feet

Length of normal pool (principal spillway crest) - 1,425 feet

e. Storage (acre-feet)

Top of dam - 167
Normal pool - 122

f. Reservoir Surface (acres)

Top of dam - 18.7
Normal pool - 14.7

g. Dam

Type - Earth with a concrete spillway

Length - 110 feet

Height - 18.2 feet

Top width - 25 feet

Side slopes - 3H:1V and 1H:1V downstream.
Upstream unknown

Zoning - Unknown

Impervious core - Unknown

Cutoff - Unknown

Grout curtain - Unknown

h. Diversion and Regulating Tunnel - None

i. Spillway

Type - Concrete weir located 300 feet north of the
left abutment

Crest elevation - 571

Crest width - 6.3 feet

Gates - None

j. Regulating Outlets

Low level outlet is a 24-inch-diameter steel outlet
pipe at invert elevation 555.6. No gate controls
were located.

SECTION 2 - ENGINEERING DATA

2.1 DESIGN

Information pertaining to the design was not available for review. An extensive search failed to locate any design data, and it appears that the dam may have been constructed without permit. However, a geotechnical review provided an overall assessment of probable foundation conditions. The dam is located in a region underlain by Ordovician Martinsburg shale. The overburden consists of recent alluvium of stratified sand and gravel stream deposits while the residual soil is a thick-bedded, glaciated shale with clay to gravel-size particles. It appears that the embankment was constructed on the existing overburden but adjoins the bedrock at both abutments.

2.2 CONSTRUCTION

No information was obtained pertaining to the construction. Field measurements provided sufficient as-built data to assess the hydraulic capacity of the spillway.

2.3 OPERATION

There is no information available pertaining to operations at this dam.

2.4 EVALUATION

a. Availability

While the original design and construction data are not available, the field reconnaissance revealed sufficient overall geometry to enable the inspection team to complete its evaluation.

b. Adequacy

In view of the hazard classification and present condition of the dam, the information obtained is believed to be adequate to perform the following assessment.

c. Validity

No design information was available for evaluation.

SECTION 3 - VISUAL INSPECTION

3.1 FINDINGS

a. General

Visual inspection of N.J. No Name Dam No. 58 was conducted on March 26, 1981. While the dam was in a fair overall condition, it appears that routine maintenance had been neglected for an extended period of time. At the time of the inspection, about 2 inches of water was discharging over the spillway weir and a tailwater was noted at the low level drain outlet. The water in the outlet channel is believed to emanate from the stone toe drain, although the iron-rich color of the pool and silt indicates that some leakage through the steel drain is also probable.

b. Dam

The dam is a straight, relatively low structure lying between two naturally higher abutment zones. It is approximately 110 feet long with a 6.3-foot-wide concrete spillway weir located 300 feet north of the left abutment. The dam crest is 25 feet wide and has a fairly uniform line although the grade is slightly irregular. The dam is overgrown with dense thickets and trees up to 9 inches in diameter. The embankment, which consists of crushed shale and clay fill, appears very stable, although there was a lack of grass cover on the 1H:1V sloping portion of the downstream face. While no erosion was observed in that area, several rodent burrows were noted in the soft clayey fill. There is a narrow foot path along the upstream face near the waterline, but no sloughing or severe erosion was observed anywhere on the embankment. The riprap along the upstream face appeared uniformly distributed, although it did not extend to the dam crest and some minor wave erosion was noted at the waterline. The stone toe drain appeared relatively level and apparently stabilizes the steeper portion of the downstream slopes in addition to relieving hydrostatic pressure within the embankment. The channel and valley downstream of the dam was somewhat marshy, with a small standing pool of water immediately adjacent to the toe drain and outlet

pipe. There is a 6-inch-thick layer of soft, orange-colored silt built up within the outlet pipe, and the controls for the gate valve could not be located anywhere at the dam.

c. Appurtenant Structures

The spillway consists of a small concrete weir located about 300 feet to the north of the left abutment. Minor spalling of the concrete wingwalls was noted and the downstream ends of the sidewalls were slightly undercut. A layer of coarse sand and gravel has built up in front of the concrete sill of the weir to an elevation slightly higher than the sill itself. The opening of the weir is 30 percent constricted by a pile of earth. It is apparent that someone recently dumped earth across the entire weir in order to block the spillway and raise the lake surface elevation. The makeshift earth dam has been breached and the water elevation has returned to the normal pool elevation. The earth remaining in the spillway channel is considered inconsequential since the next large storm will clear the spillway completely.

d. Reservoir Area

The area surrounding the lake is essentially undeveloped and densely wooded. The terrain consists of moderately steep to rolling hills with a few homes near the hilltops west of the lake. The lake itself appears relatively pristine and exhibits few signs of human habitation. No sedimentation was observed at the dam, although a light gravel buildup was noted at the mouth of the spillway.

e. Downstream Channel

The channel downstream of the dam is part of a relatively wide valley. The valley is now partly vegetated with marsh growth and thinly forested. The new stream channel to the north is at a higher elevation and joins the valley about 400 feet downstream of the dam. The downstream area is completely uninhabited as far as Pidgeon Hill Road more than 1/2 mile away. There are no homes in the flood plain between the dam and Papakating Creek approximately 9,500 feet downstream.

SECTION 4 - OPERATIONAL PROCEDURES

4.1 PROCEDURES

N.J. No Name Dam No. 58 impounds a recreational lake and was designed to be self-regulating (requiring no manual operational procedures). There is a gated low-level drain, but the controls for the gate valve could not be located and it is extremely unlikely that the drain has been operated since the dam was built. Communication with Mr. Parrot, the owners representative, reveals that the property is being held for development purposes, but no O&M procedures are currently in effect at the dam.

4.2 MAINTENANCE OF DAM

Maintenance at the dam appears to have been completely neglected in recent years. As indicated in paragraph 4.1, no maintenance is performed by the owner, nor does it appear that the dam has ever been properly attended, because there are trees as large as 9 inches in diameter growing out of the embankment and the dam is probably less than 20 years old.

4.3 MAINTENANCE OF OPERATING FACILITIES

There is no maintenance performed on the operational components of this dam. However, it appears as if someone has recently attempted to block the spillway completely by dumping a load of earth in the narrow spillway channel. The makeshift dam has since been breached, and the spillway discharge is clearing the remainder of earth from the channel.

4.4 DESCRIPTION OF ANY WARNING SYSTEM IN EFFECT

There is no warning system in effect at this dam. However, due to its low hazard classification, isolated location, and the absence of inhabitants in the downstream area, the lack of a warning system is not considered a serious deficiency at this dam.

4.5 EVALUATION OF OPERATIONAL ADEQUACY

As designed, formal regulatory procedures at this dam appear superfluous. However, the lack of embankment and concrete maintenance should be corrected. While the dam's design requires no attendant operational

personnel, the lack of any maintenance or monitoring procedures is considered a serious deficiency that could eventually result in severe problems. The potential for dam-related difficulties is emphasized by the apparently unauthorized attempt to block the spillway and raise the water level in the lake to an elevation dangerously close to the rest of the earthen portion of the dam.

SECTION 5 - HYDRAULIC/HYDROLOGIC

5.1 EVALUATION OF FEATURES

a. Design Data

Based on the criteria in the Recommended Guidelines for Safety Inspection of Dams, a 100-year frequency event was selected as the design storm by the inspection team. Precipitation data were obtained from Technical Paper 40 and NOAA Technical Memorandum NWS Hydro - 35. The inflow to the reservoir for the selected 100-year storm was computed utilizing the HEC-1 computer program. This gave a peak inflow to the reservoir of 1,403 cfs and routing reduced the peak to 1,055 cfs. The spillway has a maximum discharge capacity of approximately 255 cfs before overtopping occurs and therefore can accommodate only 24 percent of the 100-year design flood.

b. Experience Data

There are no data available with respect to the hydraulic performance of this dam.

c. Visual Observations

The spillway appears to function adequately, although its capacity is somewhat limited. The section of the rim of the lake where the spillway is located was found to be more than a foot lower in elevation than the dam. Because this portion of the lake edge is gently sloping, natural terrain, overtopping would have no detrimental effect and about 50 feet of the rim surrounding the concrete weir can function, safely, as an auxiliary spillway outlet.

d. Overtopping Potential

Because the spillway can accommodate only 24 percent of the 100-year design flood, there seems to be a high potential for overtopping at this dam. However, there are no signs or indications that any portion of this earthen dam has ever been overtopped.

e. Drawdown

Assuming that the gate valve to the 24-inch-diameter drain pipe can be located and is operable, it would take about 30 hours to lower the water level to elevation 555.4.

SECTION 6 - STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

a. Visual Observation

Although the crest of the dam has a slightly irregular grade, the dam appears to be in a fair overall condition. The change in grade on the downstream slope is uniform along the length of the dam, and the large stone at the toe apparently aids in stabilizing the embankment. No sloughing, cracking, or settlement was observed, and the embankment blends uniformly into the abutment areas. The seepage observed at the downstream toe is attributable to the toe drain and possibly some leakage through the outlet pipe. In either event, it does not appear to be a cause for concern with respect to the structural integrity of the dam.

b. Design and Construction Data

The geometry of the dam, while somewhat unusual, reflects a conservative design approach in that the width of the dam is considerably greater than contemporary standards would require for a dam of such modest height. As previously noted, however, no design or construction data were located, and the internal composition and foundation conditions are unknown. The NJDEP apparently has no dam application or microfilm records regarding this structure.

c. Operating Records

There are no operating records available or data regarding earlier inspections.

d. Post Construction Changes

While nothing could be learned about post construction modifications, it appears quite likely that the dam is presently in its initial configuration, although the crest width is considerably wider than normally dictated by design.

e. Seismic Stability

No Name Dam No. 58 is located in Seismic Zone 1, in which seismic activity is slight, and additional structural loading imparted is generally insignificant. Experience indicates that earthen dams in Zone 1 that are stable under static loading conditions will maintain their structural integrity when subjected to the negligible dynamic loads imposed by the weak seismicity characteristic of this area. This dam is considered to be structurally stable under static loading conditions.

SECTION 7 - ASSESSMENTS/RECOMMENDATIONS/ REMEDIAL ACTIONS

7.1 DAM ASSESSMENT

a. Safety

Subject to the limitations of the Phase I visual inspection, No Name Dam No. 58 is judged to be in fair overall condition. The embankment is constructed of a relatively impermeable fill and is protected by riprap on its upstream face and a stone drain at the downstream toe. Due to its large width to height ratio, the danger of structural instability is considered to be negligible, as is the damage potential from overtopping. The discharge capacity of the spillway is inadequate to accommodate the design flood. However, in view of the lack of downstream hazards, it is recommended that the hazard classification be downgraded to low.

b. Adequacy of Information

Although no records were located, the information gathered for the Phase I inspection is deemed to be adequate regarding the dam's safe operation and structural stability. It is believed that little other engineering information is available.

c. Urgency

While no urgency is attached to the remedial work described below, the owner could undertake the recommended action in order to ensure the continued functioning of the dam and its impoundment.

d. Necessity for Further Study

On the basis of the low hazard classification and general condition of this dam, additional studies are considered unnecessary within the purview of Public Law 92-367.

7.2 RECOMMENDATIONS/REMEDIAL MEASURES

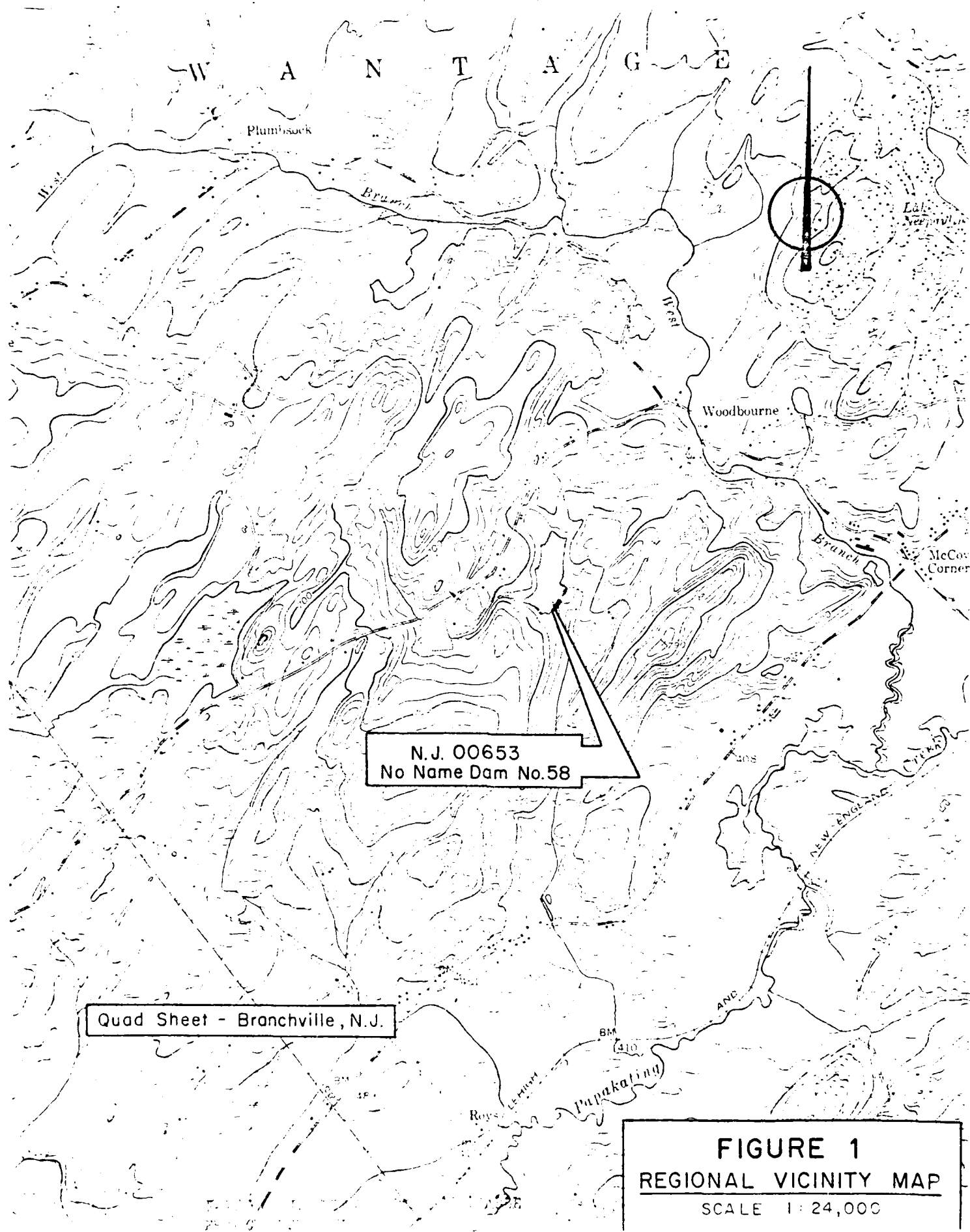
a. Recommendations

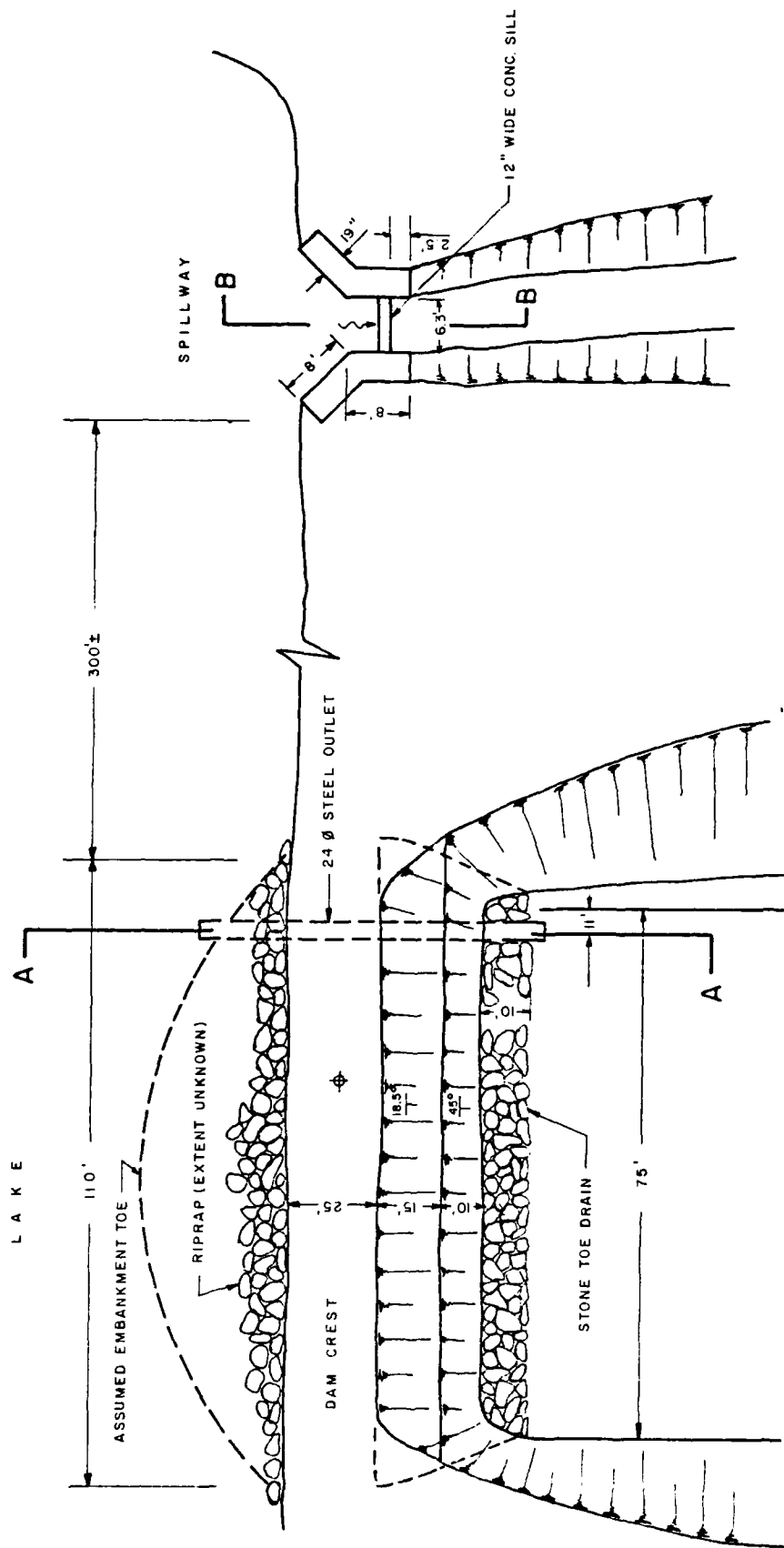
It is recommended that the owner undertake the following remedial work:

1. The gate valve for the 24-inch outlet pipe should be located and the control tested to ensure its proper functioning.
2. The silt should be removed from the outlet pipe.
3. The trees and brush should be removed from the embankment, the crest should be regraded, the crest and back slope should be reseeded, and the animal burrows should be filled.
4. The earth in the spillway channel should be removed, the deteriorated concrete repaired, and the undercut portions of the sidewalls refilled.

b. O&M Maintenance and Procedures

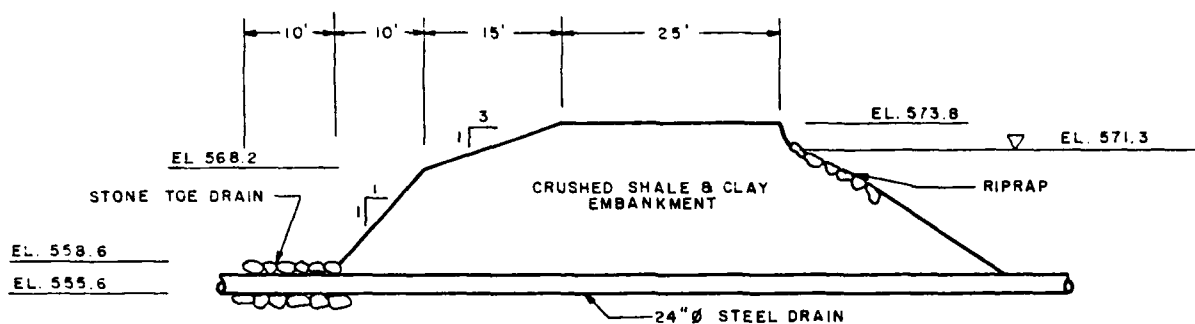
In view of the assessment contained herein, no additional procedures other than those previously described and normal maintenance appear to be required. While a downstream warning system is considered unnecessary, the owner should develop a periodic inspection and maintenance program whereby any further deterioration could be noted and corrective measures undertaken. It is further recommended that the low-level drain be opened several times a year to ensure its proper functioning.





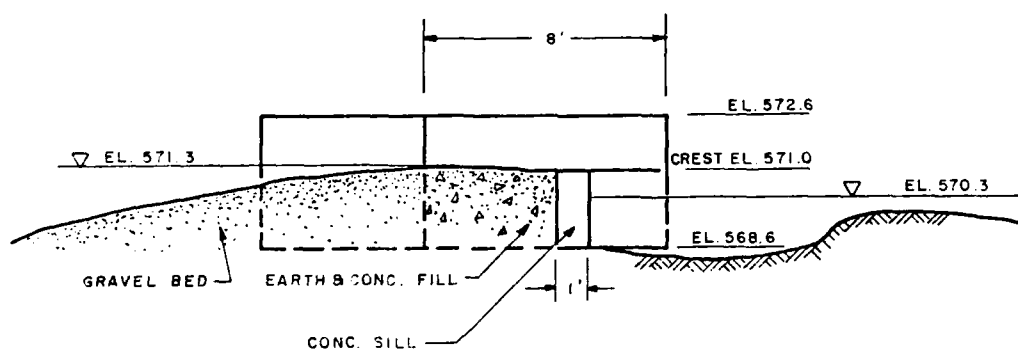
PLAN OF DAM AND SPILLWAY

NOT TO SCALE



DAM SECTION A-A

NOT TO SCALE



SPILLWAY SECTION B-B

NOT TO SCALE

Check List
Visual Inspection
Phase 1

Name Dam N.J. No Name Dam No. 58 County Sussex State N.J. Coordinators N.J.D.E.P.

Date(s) Inspection March 26, 1981 Weather Clear Temperature 50° F

Pool Elevation at Time of Inspection 571⁺ M.S.L. Tailwater at Time of Inspection 556⁺ M.S.L.

Inspection Personnel:

T. Chapter _____

A. Perera _____

J. Moylt N.J.D.E.P. _____

A. Perera Recorder

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	None observed	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None observed	
SLOUGHING OR EROSION OF EMBANKMENT AND ADJUTENT SLOPES	Footpath along the upstream slope at the water's edge. No sloughing observed but several rodent burrows noted on downstream slope.	Embankment is composed of crushed shale and clay fills. Little grass cover established on the downstream slope but soil appears stable. Rodent burrows should be filled and grass established.
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	Horizontal plane of crest is slightly irregular.	Undulations are minor and appear to be of little consequence but crest could be regraded.
RIPRAP FAILURES	Riprap on the upstream face seems reasonably uniform. No failures observed.	

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
VEGETATION	Entire dam is overgrown with trees (up to 9" diameter) and thickets.	The embankment should be cleared of all undesirable vegetation including trees, brush, thickets, etc.
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	The embankment grades smoothly into the abutments. Entire rim of the lake is uniform in elevation and geometry along this section of the water's edge.	Spillway is located about 300' north of dam in a slight saddle on the lake's rim.
ANY NOTICEABLE SEEPAGE	Considerable seepage through the downstream stone toe drain. Downstream valley is marshy in nature. Shallow pool of standing water at the foot of the drain.	Water does not appear to be moving and has an iron-rich color, suggesting leakage from the 24"-diameter outlet pipe.
STAFF GAGE AND RECORDER	None	
DRAINS	Stone drain along D/S toe. Stone size up to 18" diameter. Stone bed is at least 10' wide x 3' thick and may also function as a stabilizer for the D/S embankment.	

OUTLET WORKS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	Not applicable	
INTAKE STRUCTURE	Not applicable	
OUTLET STRUCTURE	24"-diameter steel pipe in good condition although partly filled with silt (~ 6 inches). Valve may be leaking.	Silt should be removed and valve tested.
OUTLET CHANNEL	Pipe ties into natural valley which was the original channel of the stream. Valley is relatively wide and unobstructed although somewhat overgrown with marsh vegetation.	No constriction to flow.
EMERGENCY GATE	Not observed or located	Controls for gates should be located and tested.

UNGATED SPILLWAY (Located 300' + North of the Dam)

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	Fair condition. Light spalling on edges of the wingwalls. Slight undercutting of downstream sidewalls. Spillway was filled with earth in attempt to raise water elevation. Earth was breached but weir is still partially blocked.	Concrete deterioration should be repaired and undercut areas refilled. Earth remaining in spillway should be cleared.
APPROACH CHANNEL	Sand and gravel lake bottom between wingwalls. Partially constricted by earth.	Earth should be removed.
DISCHARGE CHANNEL	Clear natural channel.	No constrictions observed
BRIDGE AND PIERS	None	

INSTRUMENTATION

VISUAL EXAMINATION MONUMENTATION/SURVEYS	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
	None	
OBSERVATION WELLS	None	
WEIRS	None	
PIEZOMETERS	None	
OTHER		

RESERVOIR

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	Slopes are approximately 6:1, densely wooded, and undeveloped with exception of 6 or 7 homes well uphill on the west side of the lake.	Relatively remote and pristine lake.
SEDIMENTATION	None observed in area of the dam.	

DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	Approximately 120' wide and flanked by 2:1 slopes for several hundred feet. Lightly wooded and overgrown with brush. Slightly marshy in areas.	
SLOPES	Slopes about 2:1 near dam but flatten several hundred feet downstream.	Right slope appears to be a spoil embankment.
APPROXIMATE NO. OF HOMES AND POPULATION	One home 2600 feet downstream at Pidgeon Hill Road and another 6000 feet downstream near Ross' Corner-Sussex Road. Channel passes under both roads.	Homes are well above and back from the stream channel. Not in the flood plain. Road may be partially flooded but damage would be minimal.
	viii	

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION

ITEM	REMARKS
PLAN OF DAM	Not Available
REGIONAL VICINITY MAP	Available - U.S.G.S. QUADRANGLE - Branchville, N.J.
CONSTRUCTION HISTORY	Not Available
TYPICAL SECTIONS OF DAM	"
HYDROLOGIC/HYDRAULIC DATA	"
OUTLETS - PLAN	"
<ul style="list-style-type: none"> - DETAILS -CONSTRAINTS -DISCHARGE RATINGS 	"
RAINFALL/RESERVOIR RECORDS	"

ITEM	REMARKS
SPILLWAY PLAN	Not Available

SECTIONS

DETAILS

OPERATING EQUIPMENT
PLANS & DETAILS

" "

ITEM	REMARKS
DESIGN REPORTS	Not Available
GEOLOGY REPORTS	" "
DESIGN COMPUTATIONS	" "
HYDROLOGY & HYDRAULICS	" "
DAM STABILITY	" "
SEEPAGE STUDIES	" "
MATERIALS INVESTIGATIONS	" "
BORING RECORDS	" "
LABORATORY	" "
FIELD	" "
POST-CONSTRUCTION SURVEYS OF DAM	" "
BORROW SOURCES.	" "

ITEM	REMARKS
MONITORING SYSTEMS	Not Available
MODIFICATIONS	" "
HIGH POOL RECORDS	" "
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	" "
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	" " "
MAINTENANCE OPERATION RECORDS	" " "



March, 1981

View of Dam Crest



March, 1981

View of Upstream Face of Dam



View of Stone Toe Drain

March, 1981



View of 24" Ø Steel Outlet Pipe

March, 1981



March, 1981
Upstream View of Spillway 300' North of Dam



March, 1981
Downstream View of Spillway

CHECK LIST
HYDROLOGIC AND HYDRAULIC DATA
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: 0.78 sq. mi.

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 571 NGVD (122 acre-feet)

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): N/A

ELEVATION MAXIMUM DESIGN POOL: Unknown

ELEVATION TOP DAM: 573.8 NGVD (167 acre-feet)

CREST: Spillway

- a. Elevation 571 NGVD
- b. Type Concrete Weir
- c. Width 1 ft.
- d. Length 6.3 ft.
- e. Location Spillover 300 ft. north of dam
- f. Number and Type of Gates None

OUTLET WORKS: Low-level drain

- a. Type 24"-dia. steel pipe - Gate location unknown
- b. Location 11' from left abutment
- c. Entrance inverts Unknown
- d. Exit inverts El.- 555.6
- e. Emergency draindown facilities Same

HYDROMETEOROLOGICAL GAGES: None

- a. Type _____
- b. Location _____
- c. Records _____

MAXIMUM NON-DAMAGING DISCHARGE: 255 cfs

BY _____ DATE 12/20
 CHKD. BY _____ DATE _____
 SUBJECT _____

LOUIS BERGER & ASSOCIATES INC.

SHEET NO. A1 OF 12
 PROJECT 20-276

Time of Concentration & Lag time

Time of concentration:

$A = .76 \text{ sq. mi.}$

Length along watercourse = 4150'

$\Delta H = 70'$ Slope = $\frac{70' \times 100}{4150'} = 1.7\%$

Assume channel velocity of 2 fps $\therefore t_c = \frac{4150'}{2 \times 5280} = 0.39 \text{ hrs.}$

Length of overland flow = 2100'

$\Delta H = 140'$ Slope = $\frac{140' \times 100}{2100'} = 6.7\%$

assume overland velocity of 3 fps $\therefore t_o = \frac{2100'}{3 \times 5280} = 0.19 \text{ hrs.}$

Total $t_c = 0.39 \text{ hrs} + 0.19 \text{ hrs} = 0.77 \text{ hrs.}$

2- California Culverts Method:

$t_c = \left(\frac{11.8 \times A^{.385}}{S^{.167}} \right) = 0.40 \text{ hrs.}$
 $t_c \text{ overland flow} = 0.19 \text{ hrs.}$
 $t_c \text{ Total} = 0.59 \text{ hrs.}$

3- SCS Method:

Assume CN for watershed = 61 based on Dutchess
 Hydrologic Soil Group B - good pasture land

Slope = 3.4%

$L = 6250'$

$L = \frac{1.49 L^{.77} (S+1)^{.107}}{1.49 \times 4.37^2} = \frac{6250^{.77} \cdot 7.39^{.107}}{1.49 \times 19.1} = 1.26 \text{ hrs.}$

$t_c = L/400 = 2.1 \text{ hrs.}$

Assume $t_c = 1.1 \text{ hrs.}$

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1-IT - COMPUTER HL-1 DB (CARD 1)

$t_c = 1.1 \text{ hrs.} = 1.1 \text{ hrs.} = 1.1 \text{ hrs.}$

$t_c = 1.1 \text{ hrs.} = 1.1 \text{ hrs.} = 1.1 \text{ hrs.}$

BY _____ DATE _____

CHKD. BY _____ DATE _____

SUBJECT _____

LOUIS BERGER & ASSOCIATES INC.

N.J. No. 111-1-5 No. 56

Test Storm: 100 Year Freq.

SHEET NO. A2 OF A2

PROJECT C.S. 276

Precipitation data from TP-40 & NOAA Technical
Memorandum NWS Hydro - 35

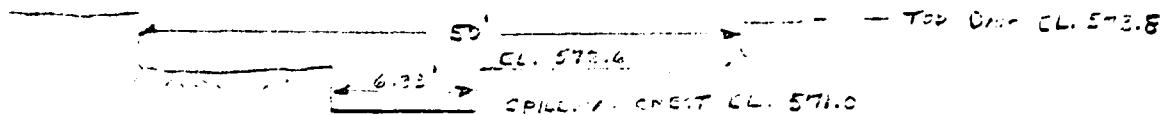
Time	Precip.	Δ	RA	Time	Precip.	Δ	RA
0.1	.91	.91	.03	3.1	4.30	.05	.91
0.2	1.46	.55	.03	3.2	4.34	.04	.35
0.3	1.81	.35	.03	3.3	4.38	.04	.23
0.4	2.07	.26	.03	3.4	4.41	.03	.17
0.5	2.30	.23	.02	3.5	4.45	.04	.12
0.6	2.46	.16	.03	3.6	4.48	.03	.10
0.7	2.63	.17	.02	3.7	4.52	.04	.09
0.8	2.77	.14	.04	3.8	4.56	.04	.08
0.9	2.89	.12	.03	3.9	4.60	.04	.07
1.0	3.00	.11	.03	4.0	4.63	.03	.06
1.1	3.10	.10	.03	4.1	4.66	.03	.06
1.2	3.20	.10	.04	4.2	4.69	.03	.05
1.3	3.29	.09	.03	4.3	4.72	.03	.05
1.4	3.36	.07	.03	4.4	4.75	.03	.05
1.5	3.44	.08	.04	4.5	4.78	.03	.04
1.6	3.51	.07	.04	4.6	4.82	.04	.05
1.7	3.53	.07	.05	4.7	4.85	.03	.04
1.8	3.65	.07	.05	4.8	4.87	.02	.04
1.9	3.71	.06	.05	4.9	4.90	.03	.04
2.0	3.76	.05	.05	5.0	4.93	.03	.04
2.1	3.82	.06	.05	5.1	4.96	.03	.03
2.2	3.87	.05	.07	5.2	4.98	.02	.03
2.3	3.92	.05	.07	5.3	5.01	.03	.03
2.4	3.97	.05	.07	5.4	5.04	.03	.03
2.5	4.02	.05	.10	5.5	5.06	.02	.03
2.6	4.07	.05	.11	5.6	5.09	.03	.03
2.7	4.12	.05	.14	5.7	5.12	.03	.03
2.8	4.17	.05	.16	5.8	5.15	.03	.02
2.9	4.21	.04	.23	5.9	5.17	.02	.03
3.0	4.25	.04	.55	6.0	5.20	.03	.02

BY: _____ DATE 3/21/71
 CHKD. BY: _____ DATE _____
 SUBJECT: _____

LOUIS BERGER & ASSOCIATES INC.

N. J. McLAUGHLIN No. 5E
 STAGE DISCHARGE CALCULATION

SHEET NO. A3 OF 11
 PROJECT CC 276



FLOW OVER
 SPILLWAY CREST
 $L = 6'4" = 6.33'$

FLOW OVER
 50' SECTION
 $L = 50'$

FLOW OVER
 DAM
 $L = 112'$

$$Q = CLH^{3/2}$$

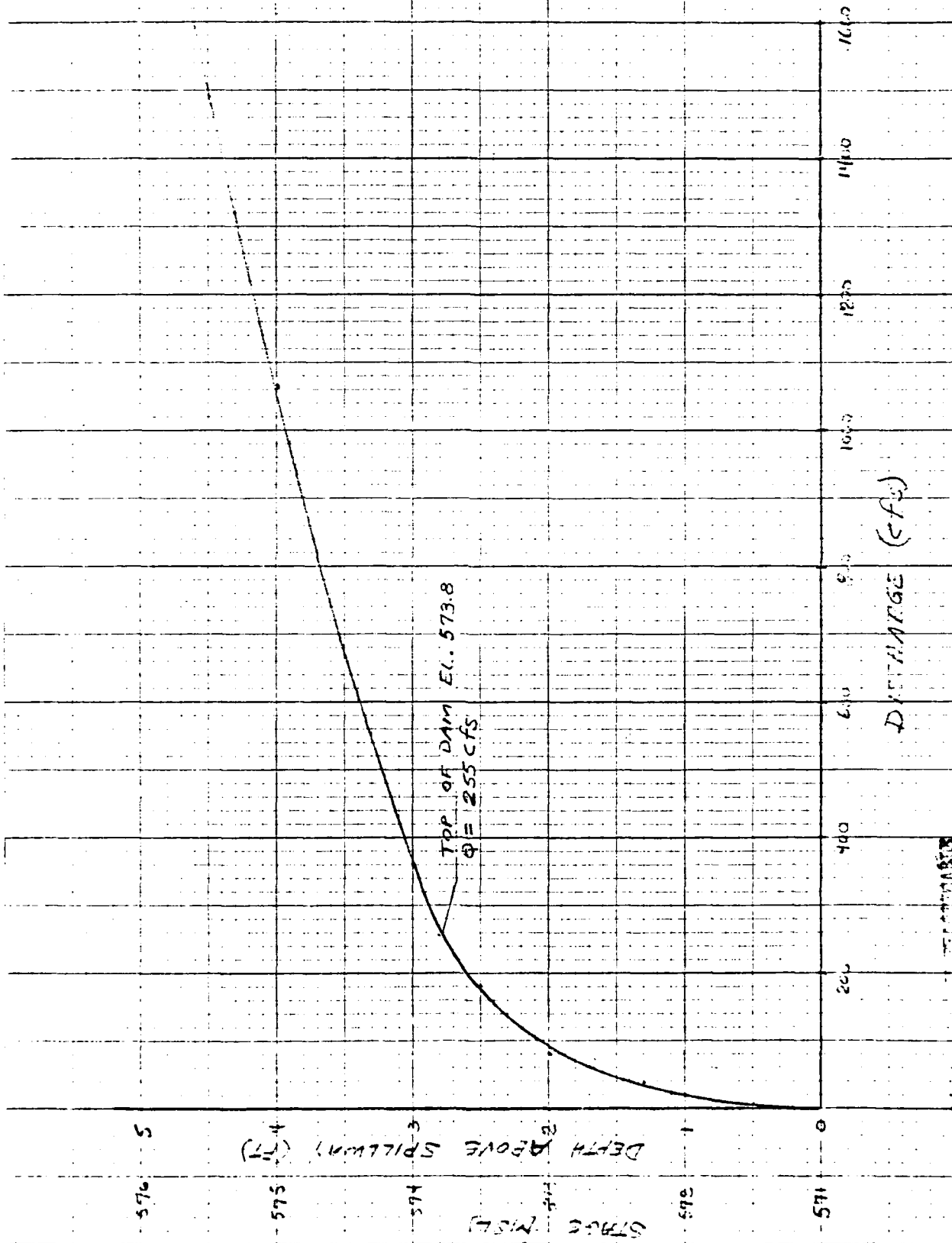
CL	H	*C	Q	H	*C	Q	H	*C	Q	Σ Q
571.0	0									0
571.5	.5	2.6	6							6
572	1.0	2.7	17							17
572.5	1.5	2.7	35	0						35
573	2.0	2.6	47	.4	2.6	33				80
573.5	2.5	2.6	66	.9	2.7	115				151
573.8	2.8	2.6	78	1.2	2.7	177	0			255
574	3.0	2.6	87	1.4	2.7	224	.3	2.6	47	355
575	4.0	2.6	133	2.4	2.6	491	1.3	2.7	440	1064
576	5.0	2.6	187	3.4	2.6	828	2.3	2.6	991	2006

*

NOTE:

Source of C in Weir Formula $Q = CLH^{3/2}$ is from
Handbook of Hydraulics King & Brooker, Table 5-3
 Fig. 5-46 For a Broad Crested Weir with a length
 approximately 10'.

STAGE DISCHARGE CURVE



BY _____ DATE 12-22

CHKD. BY _____ DATE _____

SUBJECT _____

LOUIS BERGER & ASSOCIATES INC.

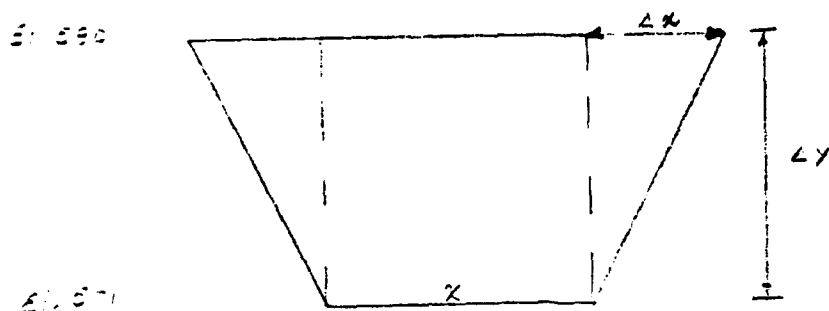
117 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 178 179 180 181 182 183 184 185 186 187 188 189 190 191 192 193 194 195 196 197 198 199 200 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230 231 232 233 234 235 236 237 238 239 240 241 242 243 244 245 246 247 248 249 250 251 252 253 254 255 256 257 258 259 260 261 262 263 264 265 266 267 268 269 270 271 272 273 274 275 276 277 278 279 280 281 282 283 284 285 286 287 288 289 290 291 292 293 294 295 296 297 298 299 300 301 302 303 304 305 306 307 308 309 310 311 312 313 314 315 316 317 318 319 320 321 322 323 324 325 326 327 328 329 330 331 332 333 334 335 336 337 338 339 340 341 342 343 344 345 346 347 348 349 350 351 352 353 354 355 356 357 358 359 360 361 362 363 364 365 366 367 368 369 370 371 372 373 374 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 391 392 393 394 395 396 397 398 399 400 401 402 403 404 405 406 407 408 409 410 411 412 413 414 415 416 417 418 419 420 421 422 423 424 425 426 427 428 429 430 431 432 433 434 435 436 437 438 439 440 441 442 443 444 445 446 447 448 449 450 451 452 453 454 455 456 457 458 459 460 461 462 463 464 465 466 467 468 469 470 471 472 473 474 475 476 477 478 479 480 481 482 483 484 485 486 487 488 489 490 491 492 493 494 495 496 497 498 499 500 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519 520 521 522 523 524 525 526 527 528 529 530 531 532 533 534 535 536 537 538 539 540 541 542 543 544 545 546 547 548 549 550 551 552 553 554 555 556 557 558 559 560 561 562 563 564 565 566 567 568 569 570 571 572 573 574 575 576 577 578 579 580 581 582 583 584 585 586 587 588 589 590 591 592 593 594 595 596 597 598 599 600 601 602 603 604 605 606 607 608 609 610 611 612 613 614 615 616 617 618 619 620 621 622 623 624 625 626 627 628 629 630 631 632 633 634 635 636 637 638 639 640 641 642 643 644 645 646 647 648 649 650 651 652 653 654 655 656 657 658 659 660 661 662 663 664 665 666 667 668 669 670 671 672 673 674 675 676 677 678 679 680 681 682 683 684 685 686 687 688 689 690 691 692 693 694 695 696 697 698 699 700 701 702 703 704 705 706 707 708 709 710 711 712 713 714 715 716 717 718 719 720 721 722 723 724 725 726 727 728 729 730 731 732 733 734 735 736 737 738 739 740 741 742 743 744 745 746 747 748 749 750 751 752 753 754 755 756 757 758 759 760 761 762 763 764 765 766 767 768 769 770 771 772 773 774 775 776 777 778 779 780 781 782 783 784 785 786 787 788 789 790 791 792 793 794 795 796 797 798 799 800 801 802 803 804 805 806 807 808 809 810 811 812 813 814 815 816 817 818 819 820 821 822 823 824 825 826 827 828 829 830 831 832 833 834 835 836 837 838 839 840 841 842 843 844 845 846 847 848 849 850 851 852 853 854 855 856 857 858 859 860 861 862 863 864 865 866 867 868 869 870 871 872 873 874 875 876 877 878 879 880 881 882 883 884 885 886 887 888 889 890 891 892 893 894 895 896 897 898 899 900 901 902 903 904 905 906 907 908 909 910 911 912 913 914 915 916 917 918 919 920 921 922 923 924 925 926 927 928 929 930 931 932 933 934 935 936 937 938 939 940 941 942 943 944 945 946 947 948 949 950 951 952 953 954 955 956 957 958 959 960 961 962 963 964 965 966 967 968 969 970 971 972 973 974 975 976 977 978 979 980 981 982 983 984 985 986 987 988 989 990 991 992 993 994 995 996 997 998 999 1000

Surcharge Storage

SHEET NO. 25 OF 3

PROJECT 12-74

Area of Lake @ = 1.571 * = 14.7 ac.
 Area at 530' Contour = 27.5 ac.
 $\Delta \text{ Sur Stor.} = \Delta y (x + \Delta x)$

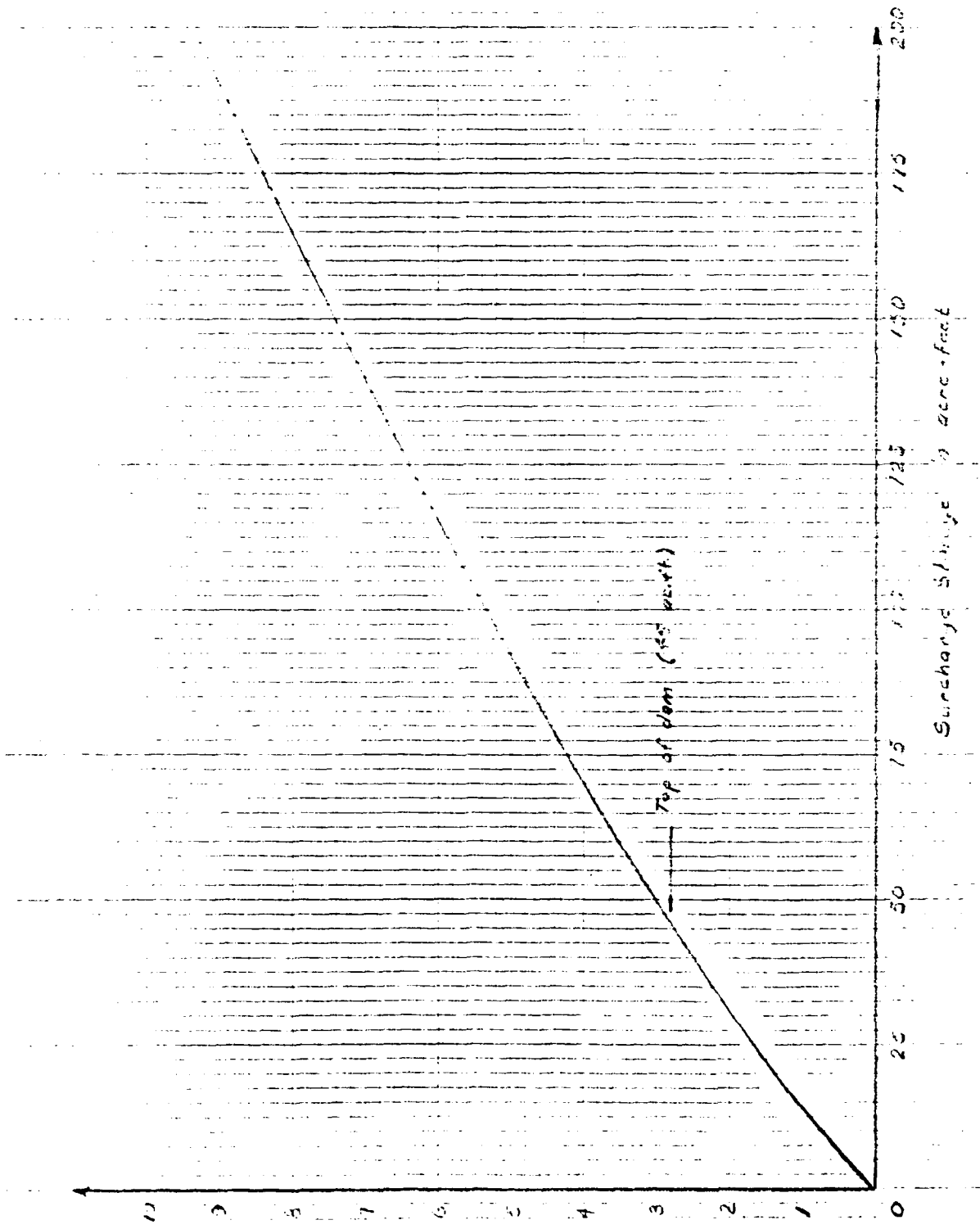


Elev.	No. Spacing (Δy)	(x + Δx)	Surcharge Storage
	ft	ac.	ac-ft
572	1	15.4	15.4
570	2	16.1	32.2
574	3	16.8	50.4
576	4	17.5	70.0
578	5	18.3	91.5
577	6	19.0	114.0
578	7	19.7	137.9
579	8	20.4	163.2
530	9	21.1	189.9

* Elev. of lake estimated on basis of slope of original stream course and upstream edge of lake.

117 No Name Dam No. 58
 Stage - Surcharge Storage
 Curve

A6 of 113



STAGE - SURCHARGE STORAGE

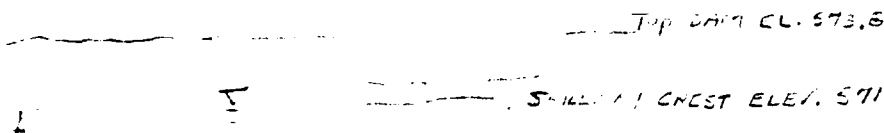
NOT FOR CONSTRUCTION

BY J.C. DATE 1-1-82
 CHKD. BY DATE
 SUBJECT Spillway Crest

LOUIS BERGER & ASSOCIATES INC.

SHEET NO. 7 OF 11
 PROJECT E-571

DRAWDOWN PIPE : 24" STEEL PIPE ASL H/L = 30'
 VOLUME STORAGE TO SPILLWAY CREST



$$\Delta H = 15.6' \text{ MAX}$$

Friction Loss in 24" STEEL

$$\text{Friction loss in pipe} = h_f$$

$$h_f = 29.1 (m^3) \left(\frac{L}{r^{5/2}} \right) : n = .012$$

$$n = 29.1 (.012)^2 \left(\frac{12}{(5)^{5/2}} \right) = 0.317$$

$$Q = C A \sqrt{2gh}$$

$$\text{or } Q = A \sqrt{\frac{2gh}{K_L}}$$

$$Q = 3.7 \text{ CFS}$$

VOLUME

A = 14.7	EL. 571
A = 9.63	EL. 563
A = 5.12	EL. 553
A = 0.0	EL. 555.4
14.7	

$$VOL = \frac{14.7 + 1}{2} \times 15.6$$

$$VOL = 120.46 \text{ ACFT}$$

ELEV.	H _f	K _e	f/D	K _L	Σ K _L	Q	VOL ACFT	DRAWDOWN TIME
571	15.6	.5	.317	1.0	1.817	74	89.52	17.2
563	7.6	.5	.317	1.0	1.817	52	23.72	6.6
553	3.6	.5	.317	1.0	1.817	35	9.32	6.4
555.4	0					0		

$$\Sigma \text{TIME} = 30 \text{ HRS}$$

$$1 \text{ DAY } 6 \text{ HRS}$$

$$\text{TIME} = \frac{VOL (ACFT) \times 43.560}{Q \times 3600 \text{ SEC/HR}} = \text{HRS}$$

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BY..... DATE 12/1/77

LOUIS BERGER & ASSOCIATES INC.

SHEET NO. 42 OF 43

CHKD. BY..... DATE.....

MT 11-1-2002 No. 53

PROJECT 2270

SUBJECT.....

HEC-1 Input Summary

EL. / MSL	HEIGHT ABOVE SPILLWAY CREST	Surrounding STORAGE AREA (ACRES)	Discharge CFS
571	0	14.7	0
571.5	.5		6
572.0	1.0		17
572.5	1.5		35
573.0	2.0		80
573.5	2.5		181
574.0	3.0		255
574.5	3.5		358
575.0	4.0		1064
576.0	5.0		2006
582.0		27.5	

BY DATE 3/24/1
 CHKD. BY DATE
 SUBJECT

LOUIS BERGER & ASSOCIATES INC.

SHEET NO A7 OF 4
 PROJECT 6272

A1 NO NAME LAKE DAM NO. 58
 A2 J. CERVOLD
 A3 MARCH 17, 1981
 B 100 0 6 0 0 0 0 0 0 0
 B1 3 1 1
 K 0 2 78 79
 K1 INFLOW HYDROGRAPH TO RESERVOIR
 M 0 2 78 79
 O 60
 O1 .03 .03 .03 .03 .02 .03 .02 .04 .03 .03
 O1 .03 .04 .03 .03 .04 .04 .05 .05 .05 .05
 O1 .05 .07 .07 .07 .10 .11 .14 .16 .26 .55
 O1 .91 .35 .23 .17 .12 .10 .09 .08 .07 .06
 O1 .06 .05 .05 .05 .04 .05 .04 .04 .04 .04
 O1 .03 .03 .03 .03 .03 .03 .03 .02 .03 .02
 T 0.5 0.1
 W2 .66
 X 0 0 1 1
 K 1 2 1
 K1 ROUTED FLOW THROUGH RESERVOIR
 Y 1 1
 Y1 1
 Y4 571 571.5 572 572.6 573 573.5 573.7 574 575 576
 Y5 0 6 17 35 80 181 230 359 1064 2006
 \$A 14.7 27.5
 \$E 571 580
 \$\$ 571
 \$D 573.7
 K 99

PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS
 RUNOFF HYDROGRAPH AT 1
 ROUTE HYDROGRAPH TO 2
 END OF NETWORK

JOB SPECIFICATION
 NO NHR NMN IDAY IHR IMIN METRC IPLT IPRT NSTAN
 100 0 6 0 0 0 0 0 0 0

JOPER NWT LROPT TRACE
 3 0 0 0

INFLOW HYDROGRAPH TO RESERVOIR
 ISTAG ICOMP IECON ITAPE JPLT JPRT INAME ISTAGE IAUTO
 1 0 0 0 0 0 1 0 0

HYDROGRAPH DATA
 IHYD IUNG TAREA SNAP TRSDA TRSPC RATIO ISNOW ISAME LOCAL
 0 2 0.78 0.00 0.78 0.00 0.000 0 0 0
 PRECIP PATTERN
 0.03 0.03 0.03 0.03 0.02 0.03 0.02 0.04 0.03 0.03
 0.03 0.04 0.03 0.03 0.04 0.04 0.05 0.05 0.05 0.05
 0.05 0.07 0.07 0.07 0.10 0.11 0.14 0.16 0.26 0.55
 0.91 0.35 0.23 0.17 0.12 0.10 0.09 0.08 0.07 0.06
 0.06 0.05 0.05 0.05 0.04 0.05 0.04 0.04 0.04 0.04
 0.03 0.03 0.03 0.03 0.03 0.03 0.03 0.02 0.03 0.02

LOSS DATA
 LROPT STRKR DLTAR RTIOL ERAIN STRKS RTIOK STRTL CNSTL ALSMX RTIMP
 0 0.00 0.00 1.00 0.00 0.00 1.00 0.50 0.10 0.00 0.00

SUB-AREA RUNOFF COMPUTATION

PRECIP DATA
 NP STORM DAJ DAK
 50 0.00 0.00 0.00
 TC= 0.00 LAG= 0.66

RECESSION DATA
 STRTG= 0.00 GRCSN= 0.00 RTIOR= 1.00

UNIT HYDROGRAPH 35 END OF PERIOD ORDINATES, TC= 0.00 HOURS, LAG= 0.66 VOL= 1.00
 31. 92 184 313 437 508 530 517 468 409
 329 249 197 156 127 101 79 64 51 40
 32 25 20 16 13 10 8 6 5 4
 4 3 2 1 0

BY DATE 4/4/71
CHKD. BY DATE
SUBJECT

LOUIS BERGER & ASSOCIATES INC.

SHEET NO. 11 OF 11
PROJECT

END-OF-PERIOD FLOW				PERIOD				COMPOUND			
MO	DA	HR	MN	RAIN	EXCS	LOSS	COMP	MO	DA	HR	MN
1.01	0.06	1	0.03	0.00	0.00	0.03	0	1.01	5.06	51	0.03
1.01	0.12	2	0.03	0.00	0.00	0.03	0	1.01	5.12	52	0.03
1.01	0.18	3	0.03	0.00	0.00	0.03	0	1.01	5.18	53	0.03
1.01	0.24	4	0.03	0.00	0.00	0.03	0	1.01	5.24	54	0.03
1.01	0.30	5	0.02	0.00	0.02	0	0	1.01	5.30	55	0.03
1.01	0.36	6	0.03	0.00	0.00	0.03	0	1.01	5.36	56	0.03
1.01	0.42	7	0.02	0.00	0.02	0	0	1.01	5.42	57	0.03
1.01	0.48	8	0.04	0.00	0.00	0.04	0	1.01	5.48	58	0.03
1.01	0.54	9	0.03	0.00	0.00	0.03	0	1.01	5.54	59	0.03
1.01	1.00	10	0.03	0.00	0.00	0.03	0	1.01	6.00	60	0.03
1.01	1.06	11	0.03	0.00	0.00	0.03	0	1.01	6.06	61	0.03
1.01	1.12	12	0.04	0.00	0.00	0.04	0	1.01	6.12	62	0.03
1.01	1.18	13	0.03	0.00	0.00	0.03	0	1.01	6.18	63	0.03
1.01	1.24	14	0.03	0.00	0.00	0.03	0	1.01	6.24	64	0.03
1.01	1.30	15	0.04	0.00	0.00	0.04	0	1.01	6.30	65	0.03
1.01	1.36	16	0.04	0.00	0.00	0.04	0	1.01	6.36	66	0.03
1.01	1.42	17	0.05	0.04	0.01	0.01	1	1.01	6.42	67	0.03
1.01	1.48	18	0.05	0.04	0.01	0.01	5	1.01	6.48	68	0.03
1.01	1.54	19	0.05	0.04	0.01	0.01	12	1.01	6.54	69	0.03
1.01	2.00	20	0.05	0.04	0.01	0.01	25	1.01	7.00	70	0.03
1.01	2.06	21	0.05	0.04	0.01	0.01	42	1.01	7.06	71	0.03
1.01	2.12	22	0.07	0.06	0.01	0.01	63	1.01	7.12	72	0.03
1.01	2.18	23	0.07	0.06	0.01	0.01	86	1.01	7.18	73	0.03
1.01	2.24	24	0.07	0.06	0.01	0.01	111	1.01	7.24	74	0.03
1.01	2.30	25	0.10	0.09	0.01	0.01	137	1.01	7.30	75	0.03
1.01	2.36	26	0.11	0.10	0.01	0.01	165	1.01	7.36	76	0.03
1.01	2.42	27	0.14	0.13	0.01	0.01	195	1.01	7.42	77	0.03
1.01	2.48	28	0.16	0.15	0.01	0.01	231	1.01	7.48	78	0.03
1.01	2.54	29	0.26	0.25	0.01	0.01	275	1.01	7.54	79	0.03
1.01	3.00	30	0.55	0.54	0.01	0.01	342	1.01	8.00	80	0.03
1.01	3.06	31	0.91	0.90	0.01	0.01	452	1.01	8.06	81	0.03
1.01	3.12	32	0.35	0.34	0.01	0.01	608	1.01	8.12	82	0.03
1.01	3.18	33	0.23	0.22	0.01	0.01	806	1.01	8.18	83	0.03
1.01	3.24	34	0.17	0.16	0.01	0.01	1031	1.01	8.24	84	0.03
1.01	3.30	35	0.12	0.11	0.01	0.01	1237	1.01	8.30	85	0.03
1.01	3.36	36	0.10	0.09	0.01	0.01	1353	1.01	8.36	86	0.03
1.01	3.42	37	0.09	0.08	0.01	0.01	1403	1.01	8.42	87	0.03
1.01	3.48	38	0.03	0.03	0.01	0.01	1385	1.01	8.48	88	0.03
1.01	3.54	39	0.07	0.06	0.01	0.01	1309	1.01	8.54	89	0.03
1.01	4.00	40	0.05	0.05	0.01	0.01	1195	1.01	9.00	90	0.03
1.01	4.06	41	0.05	0.05	0.01	0.01	1054	1.01	9.06	91	0.03
1.01	4.12	42	0.05	0.04	0.01	0.01	913	1.01	9.12	92	0.03
1.01	4.18	43	0.05	0.04	0.01	0.01	793	1.01	9.18	93	0.03
1.01	4.24	44	0.05	0.04	0.01	0.01	690	1.01	9.24	94	0.03
1.01	4.30	45	0.04	0.03	0.01	0.01	603	1.01	9.30	95	0.03
1.01	4.36	46	0.05	0.04	0.01	0.01	528	1.01	9.36	96	0.03
1.01	4.42	47	0.04	0.03	0.01	0.01	463	1.01	9.42	97	0.03
1.01	4.48	48	0.04	0.03	0.01	0.01	409	1.01	9.48	98	0.03
1.01	4.54	49	0.04	0.03	0.01	0.01	363	1.01	9.54	99	0.03
1.01	5.00	50	0.04	0.03	0.01	0.01	325	1.01	10.00	100	0.03

CFS	1403	357	214	214	SUM	5.20	4.26	0.94	21432
CHS	40	10	6	6	(132)	(108)	(24)	(24)	21432
INCHES		4.26	4.26	4.26					
ft		108.20	108.20	108.20					
AC FT		177	177	177					
THOUS CU FT		218	218	218					

BY DATE 3/7/77
 CHKD. BY DATE
 SUBJECT

LOUIS BERGER & ASSOCIATES INC.

SHEET NO 411 OF 412
 PROJECT SS 276

ROUTED FLOW THROUGH RESERVOIR

STAGE	571.00	571.50	572.00	572.50	573.00	573.50	574.00	574.50	575.00
FLOW	0.00	5.00	17.00	35.00	60.00	181.00	230.00	358.00	1064.00

SURFACE AREA= 15.28
 CAPACITY= 0.187
 ELEVATION= 571.580

CREL	SPWID	COGW	EXPW	ELEV	COQL	CAREA	EXPL
571.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COGD	EXPD	DAMWID
573.7	0.0	0.0	0.0

END-OF-PERIOD HYDROGRAPH ORDINATES

NO.	DA	HR.	MIN	PERIOD	HOURS	INFLOW	OUTFLOW	STORAGE	STAGE
1	01	0	06	1	0.10	0	0	0	571.0
1	01	0	12	2	0.20	0	0	0	571.0
1	01	0	18	3	0.30	0	0	0	571.0
1	01	0	24	4	0.40	0	0	0	571.0
1	01	0	30	5	0.50	0	0	0	571.0
1	01	0	36	6	0.60	0	0	0	571.0
1	01	0	42	7	0.70	0	0	0	571.0
1	01	0	48	8	0.80	0	0	0	571.0
1	01	0	54	9	0.90	0	0	0	571.0
1	01	1	00	10	1.00	0	0	0	571.0
1	01	1	06	11	1.10	0	0	0	571.0
1	01	1	12	12	1.20	0	0	0	571.0
1	01	1	18	13	1.30	0	0	0	571.0
1	01	1	24	14	1.40	0	0	0	571.0
1	01	1	30	15	1.50	0	0	0	571.0
1	01	1	36	16	1.60	0	0	0	571.0
1	01	1	42	17	1.70	1	0	0	571.0
1	01	1	48	18	1.80	5	0	0	571.0
1	01	1	54	19	1.90	12	0	0	571.0
1	01	2	00	20	2.00	25	0	0	571.0
1	01	2	06	21	2.10	42	0	1	571.1
1	01	2	12	22	2.20	63	1	1	571.1
1	01	2	18	23	2.30	86	1	2	571.1
1	01	2	24	24	2.40	111	2	2	571.2
1	01	2	30	25	2.50	137	3	3	571.2
1	01	2	36	26	2.60	165	4	5	571.3
1	01	2	42	27	2.70	195	5	6	571.4
1	01	2	48	28	2.80	231	6	8	571.5
1	01	2	54	29	2.90	275	9	10	571.6
1	01	3	00	30	3.00	342	13	12	571.8
1	01	3	06	31	3.10	452	17	15	572.0
1	01	3	12	32	3.20	608	25	20	572.3
1	01	3	18	33	3.30	806	36	25	572.6
1	01	3	24	34	3.40	1031	45	32	573.0

BY DATE 7/1/71
 CHKD. BY DATE
 SUBJECT

LOUIS BERGER & ASSOCIATES INC.

NS 110 111111 111111
1111 1111 111111

SHEET NO. 112 OF 113
 PROJECT 111111

1.01	3.30	35	3.50	1227.	179.	40.	573.5
1.01	3.36	36	3.60	1353.	341.	49.	574.0
1.01	3.42	37	3.70	1403.	611.	55.	574.4
1.01	3.48	38	3.80	1385.	818.	62.	574.7
1.01	3.54	39	3.90	1309.	955.	66.	574.6
1.01	4.00	40	4.00	1195.	1031.	68.	575.0
1.01	4.06	41	4.10	1054.	1055.	69.	575.0
1.01	4.12	42	4.20	913.	1037.	68.	575.0
1.01	4.18	43	4.30	793.	990.	67.	574.9
1.01	4.24	44	4.40	690.	926.	65.	574.8
1.01	4.30	45	4.50	603.	853.	63.	574.7
1.01	4.36	46	4.60	528.	778.	61.	574.6
1.01	4.42	47	4.70	463.	704.	59.	574.5
1.01	4.48	48	4.80	409.	633.	57.	574.4
1.01	4.54	49	4.90	363.	567.	55.	574.3
1.01	5.00	50	5.00	325.	508.	54.	574.2
1.01	5.06	51	5.10	292.	454.	52.	574.1
1.01	5.12	52	5.20	264.	407.	51.	574.1
1.01	5.18	53	5.30	240.	365.	50.	574.0
1.01	5.24	54	5.40	219.	339.	49.	574.0
1.01	5.30	55	5.50	200.	314.	48.	573.9
1.01	5.36	56	5.60	182.	294.	47.	573.9
1.01	5.42	57	5.70	167.	273.	46.	573.8
1.01	5.48	58	5.80	154.	254.	45.	573.8
1.01	5.54	59	5.90	143.	235.	44.	573.7
1.01	6.00	60	6.00	133.	223.	44.	573.7
1.01	6.06	61	6.10	123.	213.	43.	573.6
1.01	6.12	62	6.20	113.	203.	42.	573.6
1.01	6.18	63	6.30	103.	193.	41.	573.5
1.01	6.24	64	6.40	91.	183.	41.	573.5
1.01	6.30	65	6.50	78.	174.	40.	573.5
1.01	6.36	66	6.60	66.	165.	39.	573.4
1.01	6.42	67	6.70	54.	155.	38.	573.4
1.01	6.48	68	6.80	44.	146.	38.	573.3
1.01	6.54	69	6.90	35.	136.	37.	573.3
1.01	7.00	70	7.00	28.	127.	36.	573.2
1.01	7.06	71	7.10	22.	118.	35.	573.2
1.01	7.12	72	7.20	17.	109.	34.	573.1
1.01	7.18	73	7.30	14.	100.	34.	573.1
1.01	7.24	74	7.40	11.	92.	33.	573.1
1.01	7.30	75	7.50	9.	84.	32.	573.0
1.01	7.36	76	7.60	7.	78.	32.	573.0
1.01	7.42	77	7.70	5.	75.	31.	573.0
1.01	7.48	78	7.80	4.	71.	30.	572.9
1.01	7.54	79	7.90	3.	67.	30.	572.9
1.01	8.00	80	8.00	3.	64.	29.	572.9
1.01	8.06	81	8.10	2.	61.	29.	572.9
1.01	8.12	82	8.20	2.	58.	28.	572.8
1.01	8.18	83	8.30	1.	55.	28.	572.8
1.01	8.24	84	8.40	1.	52.	28.	572.7
1.01	8.30	85	8.50	1.	49.	27.	572.7
1.01	8.36	86	8.60	1.	46.	27.	572.7
1.01	8.42	87	8.70	0.	44.	26.	572.7
1.01	8.48	88	8.80	0.	42.	26.	572.7
1.01	8.54	89	8.90	0.	39.	25.	572.6
1.01	9.00	90	9.00	0.	37.	25.	572.6
1.01	9.06	91	9.10	0.	35.	25.	572.6
1.01	9.12	92	9.20	0.	35.	25.	572.6
1.01	9.18	93	9.30	0.	34.	25.	572.6
1.01	9.24	94	9.40	0.	34.	24.	572.6
1.01	9.30	95	9.50	0.	33.	24.	572.6
1.01	9.36	96	9.60	0.	33.	24.	572.6
1.01	9.42	97	9.70	0.	32.	23.	572.5
1.01	9.48	98	9.80	0.	32.	23.	572.5
1.01	9.54	99	9.90	0.	31.	23.	572.5
1.01	10.00	100	10.00	0.	31.	23.	572.5

PEAK OUTFLOW IS 1055. AT TIME 4.10 HOURS

CFS	1055.	306.	187.	187.	18698
CMS	30	9.	5	5.	529
INCHES		3.65	3.72	3.72	3.72
MM		92.73	94.40	94.40	94.40
AC-FT		152.	155	155	155
THOUS CU M		187	191	191	191

BY SC DATE 7-1-61 **LOUIS BERGER & ASSOCIATES INC.** SHEET NO. 112 OF 113
 CHKD. BY NI DATE NO DATE 58 PROJECT 55-576
 SUBJECT MS-1 ST SUMMARY

RUNOFF SUMMARY, AVERAGE FLOW IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)

	AREA IN SQUARE MILES (SQUARE KILOMETERS)					
HYDROGRAPH AT	1	1403.	357.	214.	214.	0.78
	(39.73)	(10.11)	(6.07)	(6.07)	(2.02)
ROUTED TO	2	1055.	306.	187.	187.	0.78
	(29.88)	(8.67)	(5.29)	(5.29)	(2.02)

SUMMARY OF DAM SAFETY ANALYSIS

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	571.00	571.00	573.70
STORAGE	0.	0.	44.
OUTFLOW	0.	0.	230.

RATIO OF PHF	MAXIMUM RESERVOIR W. S. ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
0.00	574.99	1.29	69.	1055.	2.40	4.10	0.00